S.N.M. COLLEGE, MALIANKARA
(Affiliated Mahatma Gandhi University, Kottayam)
Maliankara P.O., Moothakunnam Via, Ernakulam (DT), Kerala, India - 683516
www.snmcollege.ac.in | 0484-282386 | principalsnmc@gmail.com

3.RESEARCH, INNOVATIONS AND EXTENSIONS

3.1. RESEARCH PUBLICATIONS AND AWARDS

3.3.1: Number of research papers published per teacher in the Journals notified on UGC care list in 2021

WALAILAK JOURNAL
Natural Sciences
http://wjst.wu.ac.th
https://doi.org/10.48048/wjst.2021.23982

A Study of the Extragalactic UV Radiation in Helix Nebula using GALEX

Lakshmi S BOSE

Department of Physics, Faculty of Sree Narayana Mangalam College, Maliankara, Ernakulam, Kerala 693516, India

(Corresponding author's e-mail: lakshmisbose@gmail.com)

Received: 10 April 2021, Revised: 14 May 2021, Accepted: 21 May 2021

Abstract

We have studied the ultraviolet sources using *Galaxy Evolution Explorer* medium imaging surveys in Helix Nebula and estimated UV fluxes by using aperture photometry in distant and near ultraviolet bands. The aperture photometric method produces reliable, accurate flux measurements and found inconsistent with the merged catalog of Galaxy Evolution Explorer. From the current results, the fluxes are consistent with brighter absolute magnitude up to 24.5 and the measurement error increases gradually to more than 50 % at the fainter magnitude side. Percentage of error in far UV is greater than near UV, due to the fact that brighter galaxies are more visible than the near UV sources. The diffuse UV contributors of zodiacal light, airglow contribution in the nebula were estimated. The total extragalactic UV radiation from the detected sources to the diffuse background in the nebula is of the order of 50 ± 14 photons $cm^{-2}sr^{-1}s^{-1}Å^{-1}$ in NUV band and 28 ±10 photons $cm^{-2}sr^{-1}s^{-1}Å^{-1}$ in FUV band.

Keywords: Diffuse UV, Extragalactic UV radiation, FUV-NUV fluxes, *GALEX* observations

Introduction

One of the largest spectacular-known planetary nebulae, the Helix Nebula (NGC 7293) in the constellation of Aquarius, about 650 light years away from the Earth, is clearly recognizable in the ultraviolet sky (UV) [1]. The nebula is largely composed of molecular gas, ionized material and interstellar dust. The Helix's array of thousands of filamentary structures, or gas threads is a striking feature that was first discovered by ground-based images [2]. The region was extensively studied using the European Southern Observatory's Very Large Telescope (ESO's VLT) and Hubble Space telescope but was not completely understood. The spatial structure of helix nebula was studied by Meixner *et al.* [6] on the characterized atomic gas in this region using Hubble Space Telescope [3-6]. Morphological study of helix nebula in the infrared region helps to understand that the nebula has a central star and shows high density with cometary knots [7,8]. Recently, a white dwarf has been detected at the nebula's center with intense UV radiation that heats the gas expelled layers which shine brilliantly in the infrared (IR). Spitzer, IR mission captured the precise infrared signature of the dust and gas, while Galaxy Evolution Explorer (*GALEX*) UV mission picked out the ultraviolet light pouring out of this system. Herschel observations in the helix nebula were used to explain the dust and energy distributions over the region [9]. Molecular hydrogen (H_2), CO at infrared in a large number of globules of helix was observed and complex molecules like CN, HCO+, HCN have been identified in the nebula [10-14]. The spatial distribution of the atomic and molecular gas with the SPIRE instrument was studied by Etxaluze *et al*. [15].

Many astronomical missions are available in ultraviolet wavelength, but Galaxy Evolution Explorer −50 cm telescope conducted the first all sky surveys in UV [16]. Ultraviolet imaging of planetary nebulae with *GALEX* was taken to illustrate the variety in UV morphology [17]. The current study that used the observations of *GALEX* in helix planetary nebula can explain the nature of ultraviolet emission

ISSN 1995-0829, Inland Water Biology, 2021, Vol. 14, No. 6, pp. 691–698. © Pleiades Publishing, Ltd., 2021.

PHYTOPLANKTON, PHYTOBENTHOS, PHYTOPERIPHYTON

Phytoplankton Diversity and Environmental Drivers in a Backwater Inlet of Central Kerala, Southwest India[1]

P. V. Divya[a], * and M. G. Sanilkumar[a]

[a] *DST-FIST Research Department of Botany, SNM College Maliankara, Kerala, India*

**e-mail: pvdivyadivakar@gmail.com*

Received June 8, 2021; revised August 18, 2021; accepted September 6, 2021

Abstract—Studies were carried out for detailed understanding of dynamics of microalgal diversity with physico-chemical parameters in a back water inlet of central Kerala, India. Total of 69 species were recorded, which belong to four major algal groups were in order of: Bacillariophyceae> Chlorophyceae> Cyanophyceae> Dinophyceae with respect to their species abundance. Mean seasonal abundance was found highest in monsoon 2018 (4.634×10^3 cells l^{-1}) followed by pre-monsoon 2017 (1.580×10^3 cells l^{-1}). Margalef index (1.215–3.68) and Shannon–Wiener diversity index (0.9937–2.488) indicated moderately rich phytoplankton diversity except in monsoon 2018, which might have been affected by massive flood (The Kerala flood, 2018). CCA analysis showed temperature, pH, turbidity, nitrate, and phosphate have close relationship with the phytoplankton community.

Keywords: India, Inland water, Kerala, monsoon and phytoplankton diversity

DOI: 10.1134/S1995082921110018

INTRODUCTION

Every inland aquatic ecosystem has well-defined structures and processes that are similar in general aspects but differ in particular attributes throughout the biosphere, in which the major biotic communities include plankters, especially the phytoplankters (Mann et al., 2016). The phytoplankton are the most important autotrophic communities in aquatic ecosystem, constituting the first step of diverse trophic chain, and being one of the main primary producers in the marine, coastal, and continental water bodies and contribute the majority of production in the universe (Valenzuela-Sanchez et al., 2021). Primary production in associated aquatic system depends on floral biomass and composition that are food for primary consumers including planktivory fishes (Sridhar et al., 2006). Adequate nutrients and suitable water temperature and other ecological factors such as light, composition and quantity of organic matter, currents and grazing are essential in the water column for phytoplankton growth (Zhu et al., 2020; Sim et al., 2020).

Study on diversity of microalgae is of primary importance in aquatic ecology for assessing water quality. Direct microscopic observation and accurate enumeration are essential to document species composition and biomass and which is the only way to assess the morphological changes within the algal communities as a response to environmental variations. Their distribution and biomass change continuously with changing temperature, pH, salinity, turbidity, season and even with time of a day (Hsiao, 1992; Norton et al., 1996; Huang et al., 2004; Duarte et al., 2006; Essien et al., 2008).

Kerala is bestowed with a landmass lined by Arabian Sea, along the southwest coast of India. The prevalent monsoon period is southwest monsoon. The onset of southwest monsoon, which provides quantum of water to inland areas starts from June and end in September and termed as Monsoon (MON) period. Four months before this is termed as Pre monsoon (PRM) and the remaining four months after monsoon (October–February) is termed as Post monsoon (POM) period. The present investigation was intended to study the seasonal fluctuations of biomass and distribution of planktonic microalgae with its influencing physico-chemical parameters with the aid of various statistical indices from PRM 2017 to MON 2019, within Cherayi, a back water inlet (Part of Vembanad-Kol Ramsar site) of Central Kerala, Southwest India.

MATERIALS AND METHODS

The present work carried out in partially enclosed inland backwater system Cherayi, in Central Kerala (Fig. 1, Total area 50.55105 ha). The samples were collected in triplicate from four equidistant stations (sta-

Abbreviations: MON, monsoon period; NPP, Net Primary Production; POM, post monsoon period; PRM, pre monsoon; WRT, water resident time.

[1] The article is published in the original.

Phytotaxa 527 (1): 083–088
https://www.mapress.com/j/pt/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.527.1.9

Fimbristylis sunilii (Cyperaceae): A new species from Southern Western Ghats, Kerala, India

MALAYIL GOPALAN SANILKUMAR[1]*, VADASSERY MADHANAN NITHYA[2], PERIYATTU VEEDU DIVYA[3] & EDATHIRUTHI CHANDRAN BAIJU[4]

DST-FIST Research Department of Botany, S.N.M.College, Maliankara, Ernakulam 683516, Kerala, India

[1] *sanilmgs@yahoo.com; https://orcid.org/0000-0002-3943-4266*
[2] *nithyamadhananv@gmail.com; https://orcid.org/0000-0003-0770-197X*
[3] *pvdivyadivakar@gmail.com; https://orcid.org/0000-0001-6131-7915*
[4] *easybaiju@gmail.com; https://orcid.org/0000-0002-9588-7817*
**Author for correspondence*

Abstract

Fimbristylis sunilii, a new species of Cyperaceae, from Western Ghats of Kerala, Southwest India is described and illustrated with photographs. The paper provides distribution and phenology of the new species along with comparison of its allied species.

Keywords: Cyperaceae, New species, Western Ghats

Introduction

The genus *Fimbristylis* Vahl (1805: 285) is the third largest genus of the family Cyperaceae, having a cosmopolitan distribution, especially in the tropics and subtropics, with a centre of distribution in South East Asia. It comprises of ca. 316 species (Govarts *et al*., 2018) and recent information states that there are 320 species (POWO, 2020). Prasad and Singh (2002) reported 115 species from India. However, a few more species such as *Fimbristylis matthewii* Murugesan *et al*.(2010 :1379), *F. velliangiriensis* Murugesan *et al*. (2010: 1380), *F. clarkei* Kumar *et al*.(2013: 669), *F. pokkudaniana* Sunil *et al*. (2016: 164), *F.tuckeri* Viji *et al*.(2016: 38), *F. pandeyana* Mujaffar, Wad. Khan & Tiwari (2017: 297), *F. murthyi* Yarrayya & Kumar (2018: 198) and *F. agasthyamalaensis* Viji & Preetha (2018: 68) have also been described. At present, 123 species are found in India. Nayar *et al.* (2014) listed 91 species from the Western Ghats.

During intensive botanical studies along the Western Ghats of Kerala state in southern India, the authors collected an interesting species of *Fimbristylis* from the grasslands of Ponmudi hills, Southern Kerala (8°46'10.55"N; 77° 6'36.27"E). Detailed taxonomic studies by the perusal of relevant literature (Clarke 1894; Fischer1931; Kern 1974; Koyama 1985; Prasad & Singh 2002; Shuren *et al* 2010; Wadoodkhan 2015) and comparison with voucher specimens, revealed that this taxon is hitherto unknown to science, and is described here as a new species. It is closely related to *F. aphylla* Steud. (1855:114) and *F. salbundia* (Nees) Kunth (1837:230) but can be distinguished by characters shown in Table 1.

Taxonomy

Fimbristylis sunilii, Sanilkumar & Nithya, *sp. nov*. (Fig. 1 and 2).

Diagnosis:—*Fimbristylis sunilii,* superficially similar to *F. aphylla* Steud., by the presence of separate sterile and fertile shoot, 5-angled culm, leaves with prominent midvein and 3-sided nuts but differs from it in having horizontally shortly creeping rhizome on which culms are arranged in a row (vs short non-creeping rhizome with tufted culms), small inflorescence with 4–15 spikelets (vs large inflorescence with many spikelets), 6–13-flowered long spikelets

Accepted by Arjun Tiwari: 5 Nov. 2021; published: 26 Nov. 2021

Phytotaxa 527 (3): 234–238
https://www.mapress.com/j/pt/

Correspondence

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.527.3.8

Neanotis prabhuii, a new species of Rubiaceae from Western Ghats, India

CHANDRASSERIL NARAYANAN SUNIL[1,4], PICHAN MOHAMMED SALIM[2, 5], MATALAI KOKKARAMMATH RATHEESH NARAYANAN[3, 6], VADASSERY MADHANAN NITHYA[1,7], MALAYIL GOPALAN SANILKUMAR[1,8]* & NADESAPANICKER ANILKUMAR[2,9]

[1] *DST-FIST Research Department of Botany, S.N.M.College, Maliankara P.O., Ernakulam 683 516, Kerala, India*
[2] *M.S. Swaminathan Research Foundation, Puthoorvayal P.O., Wayanad 673 121, Kerala, India*
[3] *Department of Botany, Payyanur College, Edat P.O., Kannur 670 327, Kerala, India*
[4] *drcnsunilsnmc@gmail.com; https://orcid.org/0000-0003-3124-617X*
[5] *salimpichan@yahoo.com; https://orcid.org/0000-0001-8692-0884*
[6] *drratheeshpoduval73@gmail.com; https://orcid.org/0000-0002-5668-6377*
[7] *nithyamadhananv@gmail.com; https://orcid.org/0000-0003-0770-197X*
[8] *sanilmgs@yahoo.com; https://orcid.org/0000-0002-3943-4266*
[9] *anil@mssrf.res.in; https://orcid.org/0000-0001-9875-2195*
**Author for correspondence*

Neanotis prabhuii, a new species from the Western Ghats of Kerala, India, is described. The species resembles *N. wightiana* in its compressed, glabrous and indehiscent capsule, but differs in having quadrangular broadly winged stem, large leaf lamina with cordate to amplexicaule base and conspicuous 4–6 pairs of lateral veins, dichasial corymbose cyme, large and heterostylous flowers with bristly hairs on corolla lobes, long staminal filament and style. Notes on distribution, phenology along with comparison of its allied species are also provided.

Introduction

The genus *Neanotis* Lewis (1966: 32), is a monophyletic group containing three combinations and one synonym from *Hedyotis* Linnaeus (1753: 101) (Wikström *et al*. 2013). *Neanotis* is mainly distributed in high elevation areas of tropical Asia to Australia. Govaerts *et al*. (2014) demonstrated that *Neanotis* represented by 31 species, all over the world, recent statistic from POWO (2020) reported 34 species at present.

Hooker f. (1880) recognized 18 species of *Anotis* Candolle (1830: 431) in Flora of British India. While creating new genus, Lewis (1966) transferred 28 species from the Asian members of the invalid genus, *Anotis* to *Neanotis*. Eventually, all species of *Anotis* in Flora of British India came under the new genus which are found within the present political boundaries of India. Currently, there are 21 species of *Neanotis* reported from India (POWO, 2020), with the highest diversity of 16 species and 3 varieties from the Western Ghats (Nayar *et al*., 2014), out of which 10 species are endemic. In Kerala, the southwest part of India, the genus is represented by 8 species (Sasidharan, 2013).

The genus *Neanotis* is characterized by annual or perennial herbs, often fetid when bruised, brevicolporate pollens with (5) 6–12-aperture, 2–4-loculed ovary, capsular or rarely indehiscent fruit, seeds few to numerous, peltate, disciform to planoconvex, rounded or rarely winged.

During the systematic inventory of the genus *Neanotis* of Western Ghats, an interesting specimen was collected from Chembra Peak grasslands of Wayanad district, Kerala, India, at an altitude 1900 m. Detailed observations and study revealed its novelty and distinctness from the hitherto known species, and is described here as a new species. It is closely similar to *N. wightiana* (Wallich ex Wight & Arn. 1834: 480) Lewis (1966: 40) but differs from which in some significant characters as shown in Table 1.

UTTAR PRADESH JOURNAL OF ZOOLOGY

41(24): 106-112, 2020
ISSN: 0256-971X (P)

ANTIMICROBIAL ACTIVITIES OF NATURAL AND RECOMBINANT SPIDER SILK – A REVIEW

ANITHA ABRAHAM[1,2*], MATHEW M. JOSEPH[2] AND M. MINU[2,3]

[1]Department of Zoology, Maharajas College, Ernakulam, Kerala-682011, India.
[2]Department of Zoology, Sacred Heart College (Autonomous), Thevara, Kochi, Kerala-682013, India.
[3]Department of Zoology, SNM College, Maliankara, Kerala-683516, India.

AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author AA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors MMJ and MM managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Layla Omran Elmajdoub, Misurata University, Libya.
Reviewers:
(1) Vona-Túri Diána, Hungary.
(2) Manal Sayed Mohamed Ismail, Egypt.

Received: 07 November 2020
Accepted: 12 January 2021
Published: 04 February 2021

Review Article

ABSTRACT

Spider silk is a protein fibre spun by spiders and they use their silk for a variety of purposes such as for making webs or other structures, which function as sticky nets to catch their prey, or as nets or cocoons to protect their offspring, or for depositing sperms etc. It has a variety of properties that make them useful in a range of potential industrial and medical applications. Spider silk has been used for making fishing gears and lures, weaving ceremonial and bullet- proof garments and also used clinically as surgical sutures for centuries due to its biocompatibility, slow degradability and high tensile strength. Research on its antibacterial activity is important for humans as they are facing novel and harmful pathogens day by day. Most of the microorganisms are becoming resistant to many antibacterial agents. This review is an attempt to discuss the antimicrobial activities of natural and recombinant spider silk. Our studies revealed that antibacterial activities are exhibited by the silk of some specific species of spiders. (*Pardosa brevivulva*, *Eriovixia excelsa, Stegodyphus sarasinorum, Cyclosa confraga, Nephila pilipes, Pholcus phalangioides, Tegenaria domestica, Pityohyphantes phrygianus, Parawixia dehaani, Crossopriza lyoni, Neoscona theisi and Argiope trifasciata)*. The silk of some spider species (*Linothele fallax, Linothele megatheloides, Argiope aurantia and Latrodectus hesperus*) do not show such activity. It was observed that gram positive bacteria are more susceptible to spider silk than gram negative bacteria. Recombinant spider silk also possesses a high potential for biomedical applications because of its anti-microbial property, biocompatibility and biodegradability. Antimicrobial properties of spider silk can also be influenced by the diet and environmental conditions. Further future studies in this regard may lead to the discovery of novel biomaterials and new therapeutic drugs against microbes which will be of great significance especially in this pandemic situation.

**Corresponding author: Email: anithaabraham@maharajas.ac.in;*

THE JOURNAL OF PHYSICAL CHEMISTRY B
A JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

pubs.acs.org/JPCB

Article

Photoinduced Electron Transfer in a Self-Assembled Bis(β-cyclodextrin)-Linked Pyrene/Bis(adamantane)-Linked Methyl Viologen Donor−Acceptor System in Aqueous Solution

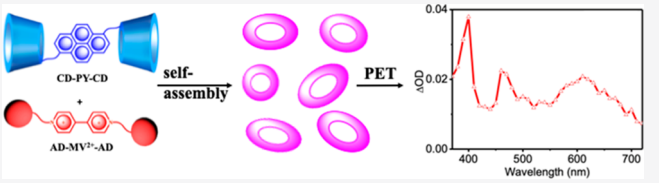
Athira K. Jeevan and Karical R. Gopidas*

Cite This: J. Phys. Chem. B 2021, 125, 4428−4437

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: Pyrene linked to two β-CD (CD = cyclodextrin; PY = pyrene) molecules (CD-PY-CD) and methylviologen (MV^{2+}) linked to two adamantane (AD) groups (AD-MV^{2+}-AD) self-assembled in water to give toroidal nanostructures. Photoprocesses taking place in the femtosecond and nanosecond time ranges within the assembly are reported. Fluorescence of the pyrene chromophore was quenched in the toroid, suggesting very efficient electron transfer. Fast quenching of the pyrene fluorescence with a time constant of 6.85 ns was attributed to photoinduced electron transfer from pyrene to methyl viologen within the toroid assembly. Electron transfer leads to the formation of radical ion products, $PY^{\bullet+}$ and $MV^{\bullet+}$, which were identified in the nanosecond transient absorption spectra. Because of the close packing of chromophores, the radical ions undergo fast reactions with chromophores or similar ions in adjacent stacks to give dimeric products. Since the dimeric species are not very stable, the reactions are reversed at longer time scales to generate the radical ions, which then undergo back electron transfer and regenerate the starting materials.



INTRODUCTION

Generation of a long-lived charge separated (CS) state is a very important goal in the study of photoinduced electron transfer (PET).[1−6] Initial attempts to generate long-lived CS states were inspired by the architectural features of the photosynthetic bacteria which can be viewed as a protein scaffolding that holds light absorbers and electron donors (D) and acceptors (A) in appropriate positions for efficient sequential electron transfer.[7,8] Sequential electron transfer increases the distance between the separated charges and slows down the rate of back electron transfer (BET), leading to an enhancement of the CS state lifetime. Large numbers of molecular systems have been constructed in this way, and CS state lifetimes of a few hundred microseconds have been achieved for some of these systems.[1−6] However, the CS state lifetimes and quantum yields comparable to the bacterial reaction center have been reported in a few cases of tetrads and pentads only.[9−11] Several noncovalently bound D−A systems were also constructed and studied, but the CS state lifetimes in these systems were found to be very low as well.[12,13] Confining D and A in restricted environments and/or periodically arranging them in supramolecular systems and mixed crystals are other approaches recently put forward to enhance CS state lifetimes.[14−20] Most of the above strategies are not useful for generating long-lived CS states in aqueous media. For important applications such as solar water splitting, the generation of CS states in aqueous solution is crucial, and none of the above strategies are useful for this purpose.

Recently, Huber et al. have suggested that molecular self-assembly can mimic the cascade-type electron transfer observed in the bacterial reaction center and can allow the spatial separation of photogenerated charges, leading to a long-lived CS state.[21] The donor employed in their study is a conjugated polyelectrolyte, poly(fluorene-*alt*-thiophene, PFT). PFT is a water-soluble, semiconducting polyelectrolyte which forms rod-like micelles when dissolved in water. The acceptors employed in the study are regioisomers of fullero-bis-(pyrrolidininium) iodides ($C_{60}(PI)_2$). PFT coassembled with mixed $C_{60}(PI)_2$ to give branched micelles. Excitation of a dilute solution of the PFT/mixed $C_{60}(PI)_2$ using a 470 nm laser showed ultrafast formation of a C_{60} radical anion and PFT hole polaron (P^+). About 75% of the hole polarons decayed within 200 ps, and the remaining fraction survived for several nanoseconds. In concentrated PFT/mixed bis-adduct solutions, exposure to light resulted in a permanent color change from yellow to deep green, which is attributed to the formation of a long-lived CS state.

Recently, we reported the self-assembly of bis(β-CD)-linked anthracene (CD-AN-CD) and bis(adamantane)-linked methyl viologen (AD-MV^{2+}-AD) into toroidal nanostructures.[22] The

Received: January 22, 2021
Revised: April 9, 2021
Published: April 23, 2021

https://doi.org/10.1021/acs.jpcb.1c00581
J. Phys. Chem. B 2021, 125, 4428−4437

THE JOURNAL OF PHYSICAL CHEMISTRY B
A JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

pubs.acs.org/JPCB

Article

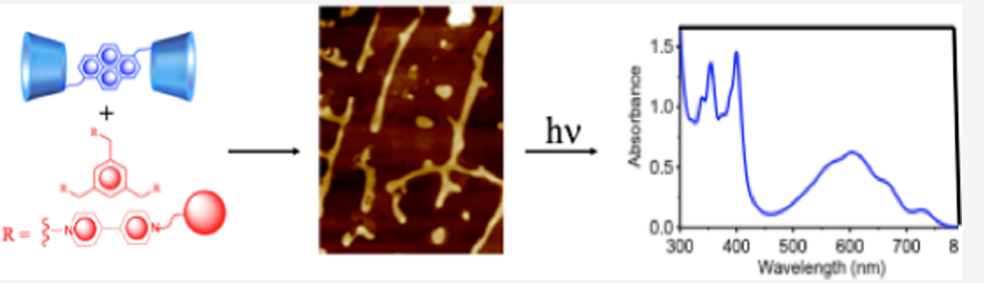
Self-Assembly and Photochemistry of a Pyrene-Methyl Viologen Supramolecular Fiber System

Athira K. Jeevan and Karical R. Gopidas*

Cite This: *J. Phys. Chem. B* 2021, 125, 8539–8549

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information



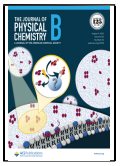
ABSTRACT: This paper reports the self-assembly of a donor–acceptor system into nanoscopic structures and the photo processes taking place within these structures. The donor employed is pyrene linked to two β-cyclodextrin molecules (CD-PY-CD), and adamantane-linked methyl viologen attached to the three arms of mesitylene (Ms-$(MV^{2+}$-AD$)_3$) is the acceptor. CD-PY-CD and Ms-$(MV^{2+}$-AD$)_3$ when dissolved in water self-assembled into vesicles, which joined together to give long fibers. The self-assembly was studied using spectroscopic and microscopic techniques. Fluorescence of the pyrene chromophore was quenched within the self-assembled system due to efficient photoinduced electron transfer to methyl viologen. Photoinduced electron transfer within the assembly is confirmed through identification of product radical ions in flash photolysis experiments. Steady-state irradiation of the self-assembled system in an optical bench led to the formation of methyl viologen radical cation, which was stable for a few hours. Longevity of the radical cation was attributed to the fast reaction of pyrene radical cation with adjacent pyrene to give an unstable adduct, which slows down the back electron transfer process.

INTRODUCTION

Photoinduced process in nanoassemblies is an important aspect of research today.[1−12] Nanoassemblies are examples of organized matter, where molecules are arranged in some sort of hierarchical order controlled by noncovalent forces such as hydrogen bonding, π-stacking, hydrophobic interactions, etc. These nanoassemblies provide unique scenarios for molecule–molecule interaction that is not generally available for free moving molecules in solution. The photophysical and photochemical reaction pathways in these nanomaterials depend critically on the degree of organization and interchromophore interactions. The course of photo reactions in terms of efficiency and regio- or stereochemistry in such systems is governed by confinement effects.[13,14] By carefully designing the constituent molecular components, nanomaterials with desirable properties and functions can be assembled. For example, nanostructures capable of device applications such as LEDs, solar cells, etc. have been realized.[15−21] Development in this area is expected to bring innovative solutions for energy and environment issues. In this paper, we describe the self-assembly and photoinduced processes taking place in a donor–acceptor (D–A) nanoassembly in aqueous solution.

Photogeneration of long-lived charge-separated (CS) state has been an important goal of photoinduced electron transfer (PET) studies for a long time.[22−28] Tolbert and co-workers have reported that molecular self-assembly can generate long-lived CS states.[29] They reported that micelle-forming cationic poly(fluorine-*alt*-thiophene) co-assembled in water with cationic fullerene derivatives to produce single micellar aggregates that could sustain photoinduced charge separation for days in aqueous solution. Although the generation of long-lived CS state in aqueous solution through irradiation of self-assembled donor–acceptor system appears very attractive, this strategy has been exploited only scarcely. Recently, long-lived charge separation in a self-assembled donor–acceptor system was reported by us.[30] Anthracene (AN) linked to two β-cyclodextrin (β-CD) molecules (CD-AN-CD) and methyl viologen (MV^{2+}) linked to two adamantane (AD) units (AD-

Received: May 19, 2021
Revised: July 8, 2021
Published: July 27, 2021



https://doi.org/10.1021/acs.jpcb.1c04417
J. Phys. Chem. B 2021, 125, 8539–8549